

## WHISTLEBLOWER REPORTING FORM

**Please mail this form to:**

Washington State Auditor's Office  
Attn: State Employee Whistleblower Program  
PO Box 40031  
Olympia, WA 98504-0031

**Before filling out this form, please read the following:**

- We are **precluded** by state law from investigating complaints involving personnel matters, or matters for which other remedies exists. This includes grievances, appointments, promotions, reprimands, suspensions, dismissals, harassment, and discrimination.
- The issue you are concerned about must have occurred **within the past year**.
- You must be a **current** employee of the State of Washington in order to file a complaint.
- In order to protect your identity, we do not recommend sending this form to our office via electronic mail.

If you have any questions, please contact Sandra Miller, Senior Investigator, at (360) 902-0378, LaRene Barlin, Senior Investigator, at (360) 902-2213, or Cheri Elliott, Investigator, at (360) 725-5358.

**Your contact information:**

You are not required to provide your name. However, if you choose not to provide your name, we are unable to keep you updated on the progress of our investigation, or to consult with you regarding the details of your complaint. If you choose to provide your name, we will keep it confidential.

Name	Agency	Date
<b>Stephen J. Lijek, P.E.</b>	<b>Department of Ecology</b>	<b>March 09, 2009</b>
Home or mailing address	Division	Day phone
<b>4510 Desert Drive, Pasco, WA 99301</b>	<b>Nuclear Waste Program</b>	<b>509.372.7913 / 942.8504 cell</b>
	Address	Night phone
	<b>3100 Port of Benton Blvd, Richland, WA</b>	<b>509.546.0883</b>
	Current position	Best time and number to call
	<b>Environmental Engineer 3</b>	<b>Days/ 942.8504</b>

**Subject's contact information:**

Please file a separate form for each state employee or officer who you believe has engaged in improper governmental action.

Name	Agency	Division
<b>State of Washington</b>	<b>Department of Ecology, Attorney General</b>	
Position	Location	Phone
Subject's Supervisor(s)	Supervisors Position(s)	Supervisor's Phone

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### How do you know about the information you are disclosing here?

I have worked at the Hanford Nuclear Site since 1991 as a consultant to the Department of Energy (DOE) then as an Ecology Nuclear Waste Program (NWP) employee, mostly as an Environmental Engineer and a regulatory specialist. My particular area of support was permitting and compliance associated with the Resource Conservation and Recovery Act (RCRA, implemented by WAC 173-303) and the Clean Air Act (CAA, implemented by WAC 173-400). The information I am disclosing stems from involvement in the Hanford site's CAA program from very early-on in the site's history with air permits. I did not working for the NWP directly, but on the "other side of the fence" so-to speak. I reviewed CAA permit submittals including the information and data the permits were based on for DOE; these permits were eventually submitted to Ecology and formed the basis for Ecology's CAA permit.

I was assigned to the Hanford Tank Farms in about 1992 where I continued working on toxic air emission; a large part being the "characterization" of the emissions. The goal of characterization is estimating mass emission rates for a multitude of toxic gases and vapors generated and released under various operations, on various tanks. This work involved interfacing with other disciplines, primarily chemists and Industrial Hygienists (IH) and Safety specialists; because this characterization is the basis for both the protection of workers, co-located workers (not directly involved in the permitted activities), and the so-called "public" outside the 3 to 5 mile radius from tank farms. The only difference between these 3 distinct populations is the distance they are located from the emissions source; otherwise the analytical tools and methods are very similar.

Industrial Hygiene and safety's involvement began because of numerous worker exposures, beginning in the late '80's and early '90's, to unknown gases, some workers experiencing severe health consequences, led to an investigation by DOE headquarters of tank farms IH program. Essentially, the DOE had no idea what types and amounts of toxic gases and vapors they were releasing, this is itself a serious violation of the Occupational Safety and Health Act or OSHA; this led to the tank farms essentially classified as an "uncontrolled Waste Site." Tank farms personnel were put on supplied air for respiratory protection until the emissions were characterized; this was, and remains, a problem because under OSHA standards a RCRA facility must be a "controlled waste site," that is, the dangerous toxic gases and vapors emitted by a RCRA facility must be known, the hazards characterized, and then the contaminants of concern must be removed or reduced to a harmless level prior to being exhausted into the breathing zone of workers or the ambient atmosphere (except under emergency conditions). Needless to say, the tank emissions were not controlled; in fact, Ecology NWP issued numerous permits that stated the gases were not controlled.

It is also known the tank farms emit gases and vapors that have no known threshold below which they are harmless. A single exposure to such toxins can lead tumor formation and cancer; at least as best as can be discerned from animal testing. Because certain industries cannot operate without some releases (e.g., nitrosamines in tire manufacturing), OSHA has allowed some lower threshold of such substances in raw material outside of a "totally enclosed system" disallowing any release of the toxins. However, OSHA also makes it clear that for routine waste management such exposures would not be appropriate.

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I lost my contract with DOE in the mid-90's and did not work at the Hanford site until about 2000 when I began working for Ecology NWP. I was hired to work on the RCRA permit for the Double-Shell Tanks, and CAA permitting. This is when I learned that essentially nothing much had really changed at tank farms. I learned that the safety issue related to toxic gases (I will use gas when referring to vapors also) and worker exposure had been closed, even without considering the implications of a Gas Release Event (GRE) on worker safety; rather, much of the IH source estimate or exposure assessment done as the result of the exposure that had occurred in the early '90's was largely based on the emissions of "quiescent" tanks, or tanks that were not being pumped, or that did not occasionally spontaneously release gases. My own emissions estimates were much higher than I had seen in data from any quiescent tank; based on the only available detailed analysis of the trapped gas in a single tank (out of 30 tanks sampled only one had this detailed data available), and other data collected for tank flammability issues resolution,

I can show through the use of a simple model, the exposure assessments conducted at the tank farms could easily be severely flawed. Even area or personal monitoring for toxic gases might not be sufficient to characterize such an exposure, because the timing and type of gases released are variable. That is, one minute there is little to nothing, but over a period of time levels increase very much, the release stops, and the air contaminants disperse. This type of release, with significant potential health consequences, may only happen once for a tank being pumped of its interstitial liquid; when the liquid level declines to some depth above a layer with something like hydrogen selenide gas, for example, and where conditions are not favorable for the formation of this gas except at this layer. Then hydrogen selenide releases into the dome space of the tank leading to levels exceeding Immediately Dangerous to Life and Health (IDLH). This means persons in close proximity to the tank may experience severe health effects if the tank is exhausting out (rather than breathing-in), or when tank containment is broken to work inside the tank. When the IH techs arrive to measure the worker breathing zone the stuff has dispersed, leaving no remnant that it was ever there. If acute events like this, or with this magnitude are uncommon, say once every 3 years per person, then the chances of catching the event using personal monitoring may be very low.

I also know that several toxicologists, including an Occupational Physician who was with University of Washington, believe the mixture of air contaminants emitted is "very bad" in its ability to induce cancer in people. Around the mid-90's DOE hired toxicologists with Pacific Northwest Labs (PNL, now a national lab PNNL) to assess the carcinogenicity of potential breathing zone concentrations. This study found that the highest level of contaminants was outside the usual "control boundary" (the area within which bystanders and co-located workers are not allowed) and that the odd of getting cancer over the working lifetime of an individual was somewhere around 1:1000, far in excess of worker safety standards, even for the manufacturing industry.

When DOE obtained the toxicological study they did not rebut the findings, or release the rebuttal for a long time. The rebuttal's main premise was that a worker would not spend 40 years, 40 hours per week in the location of maximum toxicity next to C tank farm (C-Farm). At least this part of the rebuttal was false, because many other tanks, other than C-Farm tanks, actually all of them on occasion, also emit some of the same or similar toxins with the same target organs. Toxicology is not an exact science, the original report that claimed high carcinogenicity for the gases from C-Farm included a very large safety factor due to the myriad of toxins present (synergy), which is a standard

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IH practice, but the safety factor was very high (about 1000, as I recall). Toxicologists may argue this all day, but in the end I think they might agree the gas exposure still constitutes a "threat to human health" (see 40 CFR 265.17(b)) and therefore not consistent with RCRA standards.

I also found out that a policy decision by DOE that the CAA permits granted by the NWP were supposedly protective of worker safety and health, as well as the health and safety of the public, had not been rewritten as I had recommended when I consulted for DOE. Instead the DOE told a special panel, the Technical Advisory Panel (TAP), (or sub-TAP in this case since it was the chemical reactions sub-TAP to the main tank flammability advisory panel): when asked how workers would be protected from toxic gas, DOE's response was the air permits granted by Ecology would ensure worker safety. I believe an Ecology representative attended these meeting, or should have attended them, although this specific instance I am not aware Ecology knew DOE was committing them to this. The statement was absolutely false; air permits were not considered protective of workers, except in the broadest sense. This is because the permits only consider protection for the public – workers are not considered "members of the public" for the regulatory permits at NWP, despite the federal requirement under both the CAA amendments and OSHA mandating safe operations.

Since Ecology had numerous permit people assigned to Hanford over the years, there was little to no continuity or knowledge transfer. The CAA permit writers before me, who were all Professional Engineers (PEs) as is required by the regulations, were requested to accept the position with little to no effective training or mentoring and with little to no management support. At least one of these engineers did not even apparently know where the site boundary was located. This person once told me the Acceptable Source Impact Levels (ASILs) were protective of workers as well as the public, a true statement; except he thought the site boundary was at the tank farms fence line, maybe 100 yards to even some 20 yards away, rather than 3 to 5 miles where DOE considered the ASIL needed to be met. Even then the permit holder is supposed to provide the best level of control; being lower than the ASIL does not, in itself, absolve the permit holder from controlling emissions. Since the ASILs are based on much more rigorous exposure model (70 years, 24 hours per day, lower body weight, etc) they are much lower than OSHA levels and would normally be protective of the workers; the misunderstanding came with the distances of the exposed populations from the source.

Coincident with my employment at the NWP, and beginning somewhere in the late '90's with the resolution of the "flammable gas watch list" tank issues, which allowed the pumping of liquid from the tanks with a content of trapped gas of sufficient releasable volume to pose a hazard of ignition, worker exposure began again; a repeat of the events of the early '90's. When I first started to work on the air permits for Ecology I realized that no more was known about these emissions than when I had previously been working at Hanford. Without a firm basis, in my opinion, high levels (Level B) Personal Protective Equipment (PPE) was discontinued around the mid-90's because the tank farms contractor had determined there was no threat. When pumping of the flammability watch list tanks started (remember these are tanks with a substantial inventory of gas trapped in the waste) the worker exposures began again, which anyone would expect to happen unless emissions were controlled. I had started the process of trying to change the situation, via the permitting processes, either under the CAA, or under my position as the Tank Farms (Double-Shell Tank or DST) permit writer, but found it to be impossible; hence, this complaint. Work I was involved in provided to outside organizations eventually helped in initiating a number of further studies; by independent

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groups first, then by NIOSH, DOE headquarters internal investigations, and by Union hired organizations. The NWP also did an investigation on its own which was never really completed since it recommended further investigations. The investigations resulted in tank farms again needing to require a higher level of PPE, this time Level A, or the highest level of protection and included protection of the skin against adsorption of toxins. Further sampling and analysis of the dome space of quiescent tanks was conducted, which revealed the problems I knew existed with the previous sampling episode in the mid-'90's, i.e., that it was not complete and more toxic compounds were likely present than the sampling and analysis indicated. The new sampling and analysis program found many new toxic compounds, some extremely toxic. But again, the contractor claimed the emissions they measured did not warrant the Level of PPE they were on, and the requirement was lifted in many or all locations. The document which was issued by the contractor was called the "Technical Basis for Resolving Chemical Vapor Concerns", and this document was eventually reviewed and found to be deficient by an Independent Expert Panel hired by the Hanford Concerns Council, of which the contractor is a member. This report, issued in September 2008, declared that the Technical Basis report was not conservative enough to protect workers from the ill effects of chemical vapor exposures.

The contractor's approach has not been one of "control of vapors," but rather one of assurance to workers, based on models built on sketchy and insufficient data. Thus, when workers become ill or injured due to a vapor exposure, the contractor denies that there is any connection based solely upon its model, and not upon actual monitoring data, which was never collected. Workers are not required to utilize personal protective equipment, and it is exceeding difficult and expensive, if not outright impossible, to monitor every worker for exposure to the estimated 1800 chemicals known to be present in the tank headspace gases.

After the Level A requirement was lifted a spill at Tank S-102 retrieval operation in July 2007 generated or otherwise resulted in the formation of gas that exposed a number of people located inside and outside the area of control. Some individuals experienced serious medical problems that have not been resolved. At least four workers are unable to work at Hanford and are receiving some form of compensation as a result of this spill. Prior to this spill I had been working across the street from S-Farm and S-102 doing construction inspections. (I had given up my assignments as permit writer, because I felt I was in a situation where I might be liable for these injuries, as I believe the NWP and particularly the licensed Professional Engineers, who I believe are acting in manner inconsistent with licensing requirements allowing these permits to be issued and not revoking the existing ones. I consider that these actions by licensed persons are illegal.) I realized that if I had been at my work site during the spill I myself could have been exposed, as could any NWP employee who was visiting the site. To this day no one knows what the airborne toxin was and apparently no one took samples or measured what it was, making it impossible for persons who were exposed to prove their injuries were work related.

In fact, a frustrated Industrial Hygiene Technician named Janet Rohner authored a widely-circulated email that expressed her frustration over contractor managers actually prohibiting her from taking vapor surveys of the S-102 spill area along with the investigation team that was sent into the S Farm to take radiological surveys.

I have collected many more pieces of evidence that is too voluminous to enter here. Suffice it to

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say, however, that I believe the documented history of what has happened is sufficient evidence that laws and regulations have been and are being broken. In addition, further investigation will likely reveal the quantity and even the type of air toxics being emitted is still unknown. The chemistry of the waste, which is fundamentally already a mixture of incompatible waste forms, is still largely unknown with respect to toxic gaseous emissions. The heterogeneity of the waste is not well known, or the composition of the layers including their gas content is not known, and may never be known since certain tanks are now mostly dewatered and the gas evolved out of the waste. Air toxics with very distinctive odor, such as hydrogen sulfide are common in and around tank farms, such that the IH Tank Farms procedures in place a few years ago clearly indicate it is there; yet to my knowledge, none of the sampling and analysis done at tank has ever detected this compound, or other similar gaseous compounds. None of the air permits issued by Ecology indicate a source of this gas anywhere around these areas. Furthermore, the presence of "rotten egg smell" (hydrogen sulfide) has caused the closure of 200East Area (where some of the Tank farms and the tank waste evaporator unit are located), a 4 square mile area. This and other incidents are clearly documented in newspaper articles and should be in the operating record.

I believe that what is happening here at Hanford would, in other places, be regarded as a crime; except here it is out in plain sight. The Hanford site is a prime example of a "company town" and DOE, Ecology, and EPA appear as willing victims of "regulatory capture." A revolving door between DOE, Ecology, and EPA and the contractors is rampant, as are indications of severe conflict of interest. There is also indications that persons not influenced by this corruption, and who try to do the right thing regardless of pressures placed on them by others, are "weeded out" of the system.

### What type of improper governmental action are you reporting?

- ☒ Violation of state law or regulation  
if so which RCW(s) or WAC(s)? see attached
- ☒ Substantial and specific danger to the public health and safety
- ☐ Gross waste of public funds

### Is there any evidence that supports your assertions that can be reviewed?

#### If so, where is the information and can you provide it?

I have the evidence and can provide it if requested to do so. However, much of the evidence is well documented in the public record.

### Please describe the improper governmental action in detail

The more detailed information you provide for us, the better we will be able to assess your concerns. Attach additional pages if needed. If available, please provide us with copies of documents which support your assertion.

Improper governmental action **cannot** be personnel related.

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## Complaint Summary

The Washington State Department of Ecology Nuclear Waste Program (NWP) has failed to apply or enforce important-to-safety regulations under the Resource Conservation and Recovery Act (RCRA) and Washington Administrative Code (WAC) 173-303. The Code of Federal Regulation (CFR), Title 40, Chapter 265, Section 14(b)(9), abbreviated 40 CFR §265.17(b) is applicable to the Hanford Tank Farms as a RCRA "Interim Status" facility. However, the NWP under the Ecology Department's current and former Directors, in collaboration with the Attorney General's (AG) office, and with the Department of Energy (DOE) and its contractors, has decided not to regulate these requirements in an effective manner that protects human health, i.e., the health of Hanford workers in and around the Hanford Tank Farms, including, on occasion, NWP employees.

The failure of persons managing the NWP, Ecology, and AGs office has caused and will cause harm to human health, and has and is endangering or threatening the safety of workers, including NWP employees. The present configuration of Tank Farms liquid and solid waste does not constitute a greater or more immediate risk to human health and the environment that would otherwise justify worker exposures, nor have workers been informed of the risks. That is, the health and safety of the public at the Hanford site boundary located 2 to 5 miles distant is not immediately threatened by the contained tank waste, by any exposure pathway, including groundwater, surface runoff, or air to the extent a "Chernobyl"-type response removing the tank liquid and solid wastes is and was justified or warranted as a reason to expose workers.

Persons in NWP management, Ecology, the AGs office, and the state should clearly understand, after a period of 15 years or so managing the Hanford site regulatory structure, that DOE, EPA, and their contractors were not meeting obligations to protect workers to the extent RCRA requires. Given the supposed complexity of the Hanford site, **a person would think the Hanford regulators would understand that EPA and OSHA did recognize that threatening the health and safety of waste site workers under routine or non-emergency operations is absurd.** The societal benefit does not outweigh the cost or risk; the threat may result in a net loss, at least to the overall system over time. **This threat and damage to worker health can also be viewed as an inappropriate "subsidy" to people who financially benefit from a perverse system that pays contractor's bonuses for minimizing protection of human health and the environment.**

The same situation for manufacturers is much different; for example, OSHA noted the difficulty and cost to remove N-nitrosodimethylamine from the tire manufacturing waste stream. OSHA recognized the burden to industry and subsequent cost that would be passed down to consumers so they allowed some n-nitrosodimethylamine to exist in the tire manufacturing process without compliance to the regulations specific to this toxic compound. In the same OSHA interpretation, **the agency stated that the same N-nitrosodimethylamine levels would not be appropriate for waste management** without conformance to the specific rules for the OSHA carcinogen. It should be noted that N-nitrosodimethylamine has been found in the tank farms worker's breathing zone and in the tank headspace.

In addition, OSHA notes that the Permissible Exposure Levels themselves may not be, and likely are not protective of worker's health in all industries; these levels are generally set for industry, not waste management or cleanup activities. DOE knows this and, as I recall, specifies American Conference of Governmental Industrial Hygienists (ACGIH) exposure levels; even these levels may be too high for waste management. Tank Waste Remediation Systems (TWRS), now DOE/ORP once specified or committed to the "lowest consensus standards," which for many additional toxins would be National Institute of Occupational Safety and Health (NIOSH) standards. For carcinogens this is "CA," or no exposure at all, or As Low As Reasonably Achievable (ALARA) levels at least (the radiation levels are ALARA).

In addition, there is no doubt that tank farm workers, including NWP employees, were not, and may still not be, informed of the risk they may encounter due to uncontrolled emissions from tank farms. This is not under contention, since a myriad of additional toxic chemicals were discovered in the dome space that had not been seen before mid-2000. This is a clear violation of the workers right to know and understand work place risks or hazards. NWP employees still have not been told about what chemicals and hazards they may encounter near tank farms.

The unnecessary harm that has already occurred to the health of persons in and around Tank Farms, and the continuing endangerment or threat of bodily harm posed by unknown, unexpected, and/ or more highly concentrated and mixed air

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toxics, presents a much greater risk or threat to human health and outweighs the hypothetical risk posed by present and future contaminated soil and groundwater (excluding windborne surface contamination). Persons in NWP management, Ecology, and the AGs office should have known, or did know, and were told and warned by site workers and NWP employees, and other stakeholders on numerous occasions over a period of nearly 20 years or so, that the safe management of the mixed waste under RCRA and OSHA standards and regulations was not possible without a thorough characterization of the waste based on sampling and analysis and guided by an understanding of its physical and chemical properties, or even an understanding that the chemical and physical properties cannot be known.

Persons in NWP management, Ecology, and the AGs office should have known or did know, and were told and warned by site workers and NWP employees, and other stakeholders on numerous occasions over a period of 15 years or so, that DOE and its contractors were not meeting their obligation to collect and analyze such characterization data sufficient to protect human health, and thus could not achieve the standards of worker safety required under OSHA and RCRA. In practice, the waste would be managed more safely under CERCLA rules, as the site has essentially remained an OSHA uncontrolled waste site since it was first brought under EPA and State authority via RCRA regulations.

I also believe, and I think it can be made obvious, that the current organization of the NWP is in internal conflict, between the faction or group writing the permits, the "technical" faction, and the "negotiation and project management" and overall management factions often at odds with one another. The path of least resistance or conflict is to do what the DOE and the contractor want, since to do otherwise often means stagnation or defunding of the project. What is more, the project management side is rewarded for showing "progress," such as, for example, issuing permits and accomplishing discrete scope of work such as saltwell pumping (or dewatering the Single-Shell Tanks). The technical faction is or should be responsible for preparing effective permits that protect human health and the environment solely under their discretion, not influenced or coerced by project managers or management, or any political need to show progress.

If the technical faction is unable to resolve the issues, for whatever reasons, to keep abreast of the work-schedule benchmarks (i.e., "milestones") will be missed, it will be nearly impossible to make up for the technical needs at a later date. This has happened with saltwell pumping; resolution of flammability safety issues did not incorporate the toxic emissions concerns, and saltwell pumping of tanks containing a substantial inventory of unknown gases were pumped and the toxic gas allowed to escape into the air threatening and causing damage to human health. Even when it became obvious persons were being hurt, it was still nearly impossible for the permit writer or technical person to correct the problem.

Professional Engineers (PEs) are required to report to the State when the public health and safety is jeopardized, and when PEs practice outside their area of expertise; both of these situations have been common at Hanford. I believe these ethics rules apply, at least in the former case, even when the safety issues are not directly the responsibility of the engineer; since to ignore the health and safety of persons would be immoral, and so the PE would not be "in good moral standing" by ignoring the issue. In some states, failure to report a crime is itself illegal. In this case the crime is the repeated failure to follow OSHA respiratory protection standards; committed by the federal government contractors against residents of the state of Washington under authority, or permission of both the federal and state governments.

This complaint follows the reporting of this problem to Ecology management, Washington Industrial Health and Safety Administration (WISHA), the Department of Energy or DOE (by others), the FBI via phone call and this complaint, to the National Institute of Safety and Health (NIOSH), and to the Defense Nuclear Safety Board (DNFSB) and, although there has been or was some improvement in operating conditions, much of that has since eroded, and an imminent hazard still exists to tank farm workers and to co-located workers outside the area tank farms controls. I believe the current management of the NWP, Ecology, and other state and federal agencies cannot or will not, or is otherwise unable to bring the tank farms to a safe state, or to cause the DOE to fulfill its responsibility under law to bring the project into a safe condition, even if it is possible.

This complaint fulfills my obligation under the ethics laws, and other laws and requirements under the Washington Administrative Code regulating licensed individuals and professional engineers. I hereby recommend the repeal of Interim RCRA Status, and the repeal of all CAA permits affecting the 200 Areas, at minimum, until these threats to health and safety of the public (i.e., workers and co-located workers primarily) are controlled and until people are allowed the right to know to what toxins they may be or have been exposed to.

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## Explanation and Evidence

On at least two occasions over nearly 20-years the RCRA tank farms has taken-on the characteristics of an "Uncontrolled Waste Site," as defined in 40 CFR 1910.1200, because unknown gases and vapors were harming worker's health. Consequently, tank Farms resorted to Level A or Level B Personal Protective Equipment (PPE). This level of protection is ordinarily not pertinent to RCRA facilities. By definition a RCRA facility is a "Controlled Waste Sites," which under non-emergency or routine operations and conditions must follow the OSHA Respiratory Standard. The OSHA respiratory standard pertinent to a RCRA facility under routine operations is engineering controls, including equipment to remove and/or disperse toxic gases emitted by the tanks to levels not constituting a "threat" to, or an "endangerment" of human health.

It is very important to recognize the requirement 40 CFR §265.17(b) applies to the tank waste, also a RCRA mixed waste, because it is **already a mixture of incompatible waste forms since it is capable of generating flammable and toxic gases**. This fact is well known, although the chemistry of how the waste generates toxic gases and vapors is complex and poorly understood. The CFR has an analogous "final status" RCRA requirement, but the tank farms are still "interim status," hence the CFR above applies to the facilities by reference (see Standards and Codes, WAC 173-303-400 below).

Tank farms reverted to, or took on the characteristics of an uncontrolled waste site several times over the last 15 years when workers donned LEVEL A or B PPE (supplied air). After each episode of worker injury Tank Farms initiated a sampling and analysis program aimed at explaining the worker exposures. Starting in the early '90's, the first sampling and analysis process was not completed, primarily because detailed sampling and analysis never happened.

Nevertheless, even though the exposures remained unexplained by the data, after several years and under increasing pressure from regulatory authorities and other stakeholders, the owners, operators, and, implicitly, the regulators, decided no worker exposures occurred above acceptable levels. That is, the data took precedence over the word of employees who experienced or witnessed the events that led to the investigations. The irony of this presumption is that there is no reliable data to justify such a conclusion. Numerous expert and technical assessments have arrived at the conclusion that the data sets collected by the contractor in past years is suspect, non-existence, not subject to Quality Assurance requirements, and data collection performed by uncertified and untrained personnel. To illustrate, of the 177 underground nuclear waste tanks at Hanford, 30% have never been tested for so-called headspace content (the air space between the level of liquid waste and the top of the tank). Most of the tanks have only been tested once. Even the tests that were conducted were usually for flammability or other data quality objectives *other than* the potential health effects of the chemical vapors.

Of the 1,800 chemicals known to be in the tank headspace of those tanks that were tested, most have never been analyzed for health effects, and there is no independently adapted and agreed upon Occupational Exposure Limit. Monitoring for the chemicals also presents an impossible challenge: many of the chemicals can only be detected using laboratory analysis, meaning that there is no field, or real-time, test that can be used to assess the breathing environment of workers.

In the late '90's worker exposures began again. Level A PPE was instituted until the farms were again deemed safe. I suspect the most recent sampling and analysis program was much more rigorous in its analytical processes, but I doubt the design of the sampling program itself was sufficient to detect or identify the breadth of possible worker exposures, or the worst-case exposure scenarios. The physical and chemical nature of the waste is not sufficiently known to facilitate sampling plan design, and data was not taken in the correct locations or at the proper times.

The results of each sampling and analysis episode, including the most recent, have failed to adequately explain how the exposures happened and the symptoms experienced by the workers. Consequently, because 20 CFR 1910.120 as applied to a RCRA facility allows considerable discretion in the application of worksite protective measures, the operator unilaterally lifted protective measures with the tacit or implied approval of the state and federal government and its agencies. The state's position, as expressed by my management, is there's nothing the state can do. The federal government does nothing and refuses to accept anything has happened at all; DOE and EPA apparently believes the cause of the worker's injuries and complaints were not work-related and were blamed on the worker's themselves.

In 2004, the Department of Energy and NIOSH conducted separate evaluations of the vapor exposure issue. The DOE OA report made the following findings:

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- ★ "CH2M HILL tank characterization and personal sampling data is too limited to conclude that the exposure of all workers is below regulatory thresholds for all chemicals to which they might be exposed."
- ★ "Significant vulnerabilities in the CH2M HILL industrial hygiene program will, until corrected, continue to raise uncertainties in determining whether some workers are being overexposed to some chemical vapors."
- ★ "CH2M Hill has not required sufficient rigor, formality, or specificity in the processes used to identify and implement controls needed to ensure effective hazard mitigation."
- ★ "Weaknesses in design, testing, maintenance, and configuration management of engineered controls reduce their effectiveness."
- ★ "[DOE] has not adequately addressed weaknesses in its oversight of the CH2M HILL industrial hygiene program and has not ensured timely corrective actions for identified issues."
- ★ "[Hanford contractors] have not properly classified and reported some injury and illness cases. And their injury and illness reporting programs and quality assurance processes are not sufficiently rigorous, contributing to omissions in documentation and case management of reported injury and illnesses."

In response to the damning words of the DOE report about the lack of protections for workers at the tank farms, the contractor (CH2M Hill) undertook the publication of a report called the "Technical Basis for Resolving Chemical Vapor Concerns," which was released in 2006. Based upon this report, which claimed to resolve the vapor issues, Hanford tank farm employees once again were not required to don supplied air PPE when working around Hanford tanks. However, a mediation group at Hanford called the Hanford Concerns Council hired an expert panel to review the Technical Basis report. The contractor is a member of the Concerns Council. In September 2008, the Expert Panel review was released by the Council. Excerpts include:

- "The fact that not all tanks have been sampled and less than 30% of the tanks have been sampled more than once suggests that there was not a systemic comprehensive strategy employed to characterize head space variability over time either during quiescent conditions or during waste disturbing activities." (P.11 Expert Panel Tech Basis Review).
- "It is not clear how much of an effect sample storage issues may have on data quality and subsequent interpretation of samples collected. . . if some chemicals were not identified or were misidentified (it would result in) the wrong universe of chemicals being evaluated in subsequent steps of risk assessment...There is concern that the quantities of some chemicals may have been underestimated, leading to their not being included in the COPC list...The committee is not confident that the current sampling data capture the right universe of chemicals for setting OEL's." (Pp.12-13 Expert Panel Tech Basis Review).

Another key conclusion of the Expert Panel included: "[T]he committee is unable to conclude that the protective measures are sufficiently conservative to protect worker health. There are several areas in the Technical Basis where there is significant uncertainty in sampling data. One area in particular deals with the impact of waste disturbing activities on the emission characteristics of a tank over time. The committee has identified several opportunities where the approach outlined in the Technical Basis document could be made more conservative, i.e., more protective of workers, by reducing uncertainty." (p. 4, Executive Summary).

The full review is available at [www.hanfordconcernscouncil.org](http://www.hanfordconcernscouncil.org).

Subsequent to each sampling and analysis episode that indicated nothing explaining the exposures, then followed by a declaration the tank farms are safe, the operator relaxed protective measures. The unexplained worker exposures began again, most recently with the spill of waste during the retrieval of tank S-102 around August 2007. Continuing since the 1990's workmen's compensation claims have apparently been granted to exposed workers. Whether through the courts, by arbitration, or by out-of-court agreements it seems to me undeniable that the parties involved, including the state,

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recognize these injuries are work-related. Furthermore, even the inability to fully explain the exposures constitutes "endangerment," or a "threat" to human (worker) health (see Standards and Codes, WAC 1273-303-283). Failure to abide by OSHA rules, in itself, constitutes a "threat" to human health.

It is therefore undeniable DOE was out of compliance with the OSHA and RCRA requirements in the past, has failed to adequately "characterize the emissions, and has failed to control the emissions. **The simple fact that additional air toxics were discovered during most recent sampling campaign means that there were unknowns and the waste was not fully characterized previously; this is a fact and is not under dispute by anyone.** Every single other OSHA respiratory requirement hinges on the quantity and type of toxins emitted, the breathing zone concentrations of these toxins, and the duration workers are exposed. These data are crucial to determine risk, warn workers of the hazard, determine the specifics of engineering, administrative controls, and hygiene requirements. Lastly and only lastly can PPE necessary to minimize exposure, determine hygiene requirements, and what medical providers need to monitor.

Since I returned to the Hanford site in early 2000, and during the time I was a NWP employee, I worked very hard in vain to convince the NWP and Ecology management, including the AG's office, that the tank characterization data sampling and analysis, and the permits based on this data were severely flawed and incomplete, and current tank farm operation based on the data were dangerous to employees and bystanders, including NWP employees. I initially thought NWP was not aware of the problem; later on I found out NWP staff had been aware of the problem for many years, even prior to 1990. I was told NWP management did not act because, "...no one's dropping dead," as one manager put it. While most NWP employees and management did not seem to have a clear understanding of OSHA, rather they thought they were safe because of a subjective "feeling" rather than scientific inquiry and analysis of the facts.

I provided regulatory references and technical information that needed to be incorporated into the NWP permits, what I thought clearly spelled out not only NWP/ Ecology authority, but their duty and obligation to enforce these safety requirements prior to pressing ahead with waste retrieval and treatment. Although an investigation was begun by NWP it was never really completed as neither the proper resources nor enough time was allocated towards resolving the problem of unknown emissions and worker injury. **Investigations by NIOSH and other independent and non-independent investigations treated this problem as an Industrial Hygiene problem, whereas it is fundamentally and primarily a problem with radiation chemistry and the mechanism of gas and vapor release. The chemistry and physics of the significant releases that are demonstrated to be detrimental to health should be modeled before hand to ensure how an exposure assessment must be designed.**

Since it is clear OSHA requirements were violated, then it is also undeniable the state has also failed to protect human health, by not enforcing the regulations, e.g., **WAC 173-303-400, 40 CFR §265.199, 40 CFR §265.17, WAC 173-303-395(1)(b)** and the documentation requirements of **40 CFR §267.17** and **WAC 173-303-395(1)(c)**, and **WAC 173-303-283**. The full wording of these regulations is provided as references further on in this report. In addition, on at least one occasion, NWP management was warned of **imminent hazard** to workers prior to the discovery of additional air toxics in early 2000, and it was subsequently shown that such a hazard had existed.

Prior to withdrawing from my position as the CAA permitting engineer and the DST Part B permit engineer, I was going to remove the CAA permits under which continued waste retrieval and treatment was occurring. I made it clear the actions NWP was taking, that is, "**permitting**" or "**allowing**" activities that were clearly and knowingly threatening or endangering human and worker health was an **act of moral turpitude** and contrary to the laws and the implementing regulations. In hindsight I regret deeply not being able to take away the permits since, if I had done so, some people would not have been hurt.

Ecology continues to ignore the provisions of RCRA necessary to protect worker and human safety. Ignorance of how the waste generates and releases toxic gas, and failure to provide appropriate controls through the permitting process is a continuing problem and ensures continuing and unnecessary risk to human health. This risk does not only extend to tank farm workers, but also to collocated workers, including NWP employees, and to persons anywhere the waste and waste residues happen to go.

For example: certain NWP employees commonly visit retrieval sites to observe the work, if these employees were present when the spill of S-102 waste occurred they could have been among the people, both in and around the tank farms so-called control zone or exclusion zone that were injured (in fact, the tank Farms had not generally established buffer zones, or any other kinds of protective areas other than the fence line). In addition, workers present at the facility where the

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contaminated soil generated during the cleanup of the spill (e.g., Central Waste Complex or CWC) could also be affected if the waste continues to generate the offending gas or vapor, even at lower emission rates the CWC is enclosed inhibiting gas dispersal. I worked in proximity to S-102 for about a year. No one informed me the retrieval of waste from this tank had started; a violation of my basic right to choose whether I wanted to be there or not. I currently have hematological changes to my person that I cannot preclude are not due to exposure from S-102 emissions.

There are several primary issues of continuing concern, these are: **toxicological impacts of the generation, evolution, release, and dispersion of uncontrolled gaseous emissions from tank farms, and the continuing presence of unknown toxic gases trapped in the waste, and the generation of unknown gases due to treatment and waste intrusive activities** (e.g., evaporation, hydroxide additions, dewatering, and mixing, and many other processes which occur at tank farms and will occur at the Waste Treatment Plant). Tank waste gas generation is complex, and its chemistry still poorly understood. Despite much experimentation focused on the generation and release of flammable gases, some which are also toxic, but apparently little work has been focused towards actual measurement and laboratory studies of the so-called "trace" gas fraction of the retained or trapped gas in the tank waste matrix (concentration less than about 5% of the total gas sample).

The actual amount and type of toxic gases released spontaneously, or due to "waste intrusive" or other activities, or during a so-called "gas release event" or GRE has never been completely or effectively ascertained. Nor has the emissions from other tank waste processes: evaporation, hydroxide addition, and mixer pump operations. The known toxic gases, such as ammonia and nitrous oxide increase substantially during a GRE event, to the point that at least ammonia is known to be a significant threat (above Immediately Dangerous to Life and Health, or IDLH levels). Otherwise, to my knowledge, detailed chemical analysis of tank gas and vapor has only been conducted in the head space of "quiescent tanks," or tanks not undergoing processing or treatment, such as dewatering (removing or separating radioactive liquid from the solid waste matrix is commonly called saltwell pumping), retrieval (solid and liquid waste removal), mixer pump operation, evaporation, or hydroxide addition.

There have been recommendations to sample during releases, but the design and implementation of the sampling and analysis plan must consider the heterogeneity inherent in the waste. The tank waste is not homogeneous, as it was once thought; rather it is layered and heterogeneous. For example, the concentration of chemicals such as Arsenic, Selenium, or Tellurium compounds, even as oxides initially, and in layers, in juxtaposition with certain radionuclides providing a sufficient radiation dose, and generating nascent or newly-produced hydrogen gas, almost certainly would also generate highly toxic gas; even in small amounts the hydrides of these elements are extremely toxic. For example, and this is only an example meant to show why it might be very difficult to catch a gas release event with a sampling and analysis plan that is not continuous, and does not reflect waste heterogeneity: in a 75-foot diameter tank, half filled with sludge, there is a 1-foot layer with 40% gas-filled porosity. This gas contains 500 ppmv toxin (parts per million by volume, meaning there is 500 molecules of contaminant contained in a million molecules of gas) is evolved into the tank headspace, resulting in a headspace, or "dome space" concentration of a little over 10 ppmv.

The dome space and headspace are synonymous terms, referring to the "empty" or "air-filled" space above the liquid or solid waste; this is the gas that can migrate out of the tank, and dilute with outside air; therefore, 10 ppmv would constitute the maximum concentration a worker could be exposed. Usually this concentration would only reflect a fraction of this amount; but even divided by 20, the dilution factor indicated by IH procedures, would still result in levels one-half of the IDLH level.

To most people, particularly when expressed as a percent the "trace gas" gas concentrations, the fraction of the sample not commonly analyzed, does not seem significant. However, if, for example, the gas in this "thought experiment" happens to be arsenic hydride (or arsine) there is a significant problem, since the toxic level of arsine gas and hydrogen selenide are very low; with IDLH levels in the order of 1 ppmv.

The second part of the scenario addresses how the gas is released and how the worker is exposed: during saltwell pumping; the gas is released when pumping reduces the liquid level. Similar to dissolved gas that comes out of solution, seen as bubbles in a glass of water left standing overnight; these bubbles adhere to the sides of the glass, and remain there until we take a drink, or otherwise disturb the glass. The gas evolved from the one (1) foot thick layer disperses into the dome space; the gas then is released to the worker's breathing zone from the dome space when containment is broken, or it migrates along unsealed electrical conduit, or it is even flush out when the tank is brought on active ventilation.

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Remember, however, that the release of this gas could be a very transient event: once the dome space is flushed, the gas introduced into the ambient atmosphere around the tank, where it quickly disperses and cannot be detected; not at all like a spill of liquid waste that doesn't go anywhere. Consequently, Ecology has no way to come in after the fact and detect that anything has happened at all, and without continuous monitoring there is no record of anything happening except the narratives of the exposed workers.

The above example also elucidates why such a situation of trapped gases may not show up in the, or be reflected in the headspace of quiescent tanks: because, just like hydrogen, the gas may not be very soluble in the high ionic strength liquid tank waste. The gas is trapped in the so-called "nonconvective" tank layers, and must **diffuse** through this solid layer, convected to the surface with the liquid (or still diffuse through the liquid column in tanks with no internal heat), then partition to the gas phase; all under the general umbrella of "mass transport." Particularly the diffusion process is directly proportional to the concentration gradient, using data from S-102 and making some assumptions, including the above (for the concentration of Arsine), the concentration of Arsine in the headspace under quiescent condition would be somewhere in the order of 0.0001 to 0.001 ppbv, probably far below its detection range. This is why sporadic sampling, even with the retained gas sampler, and/ or in the tank headspace would almost never detect arsine or other extremely acute toxins (health effects noted at very low concentrations); only a detailed, continuous sampling program on virtually every tank could ever hope to see it (unless screening data precludes it, e.g., absence of As anywhere in the tank).

Other factors compound the problem: these are lack of adequate laboratory procedures, core loss during rotary or push-mode sampling, no measures to retain the gas phase during core sampling, not sampling all the tanks, or even an adequate cross-section of all the tanks, etc; these problems all fall under the overall umbrella of a sampling and analysis plan (SAP), and also preliminary data quality objective processes (DQOs). The DQO process needs to incorporate statistical analysis considering both how much needs to be known about the waste considering or weighted, in this case, by the adverse human-health affects that might result from an incomplete picture of the composition and behavior of the waste form. Similar to a geologic process, the DQO needs to consider not only the bulk constituents, but geometric arrangement of the constituents (e.g., layering effects or stratigraphy as it is called in geology) and also trace constituents, maybe dumped in a riser of a single tank. In addition, at least a conceptual chemical and physical model needs to be developed that addresses how the tanks could conceivably emit toxic gas. **The core of this complaint can be summarized by this paragraph, which also summarizes the broad and misused word "characterization," or more exactly "waste characterization." The remainder of this report is only the evidence leading me to state the waste was not adequately characterized to address worker respiratory hazards. In the process I describe here the "exposure assessment" that OSHA requires would seem to be the final step in this process, and would be preceded and also overridden by nearly continuous monitoring at the stack rather than in the breathing zone of workers.**

**The errors made, some of which are described in this complaint, begin very early on in the site's regulatory history with the State of Washington: the failure of the state to properly classify the Double and Single-Shell Tanks under RCRA rather than CERCLA, and then failing to follow through on the work necessary to "control" the site, starting with waste characterization. Mistakes were made along nearly every step of the characterization process.** For example, hydrogen sulfide or other sulfides presenting a "rotten-egg" smell are common at tank farms, yet such compounds have never been detected, at least top my knowledge. (With the exception of carbon disulfide only in small amounts.) Sometimes the rotten-egg odor is apparent over an area greater than a square mile. Yet no one knows the source; to me this indicates a problem with sampling and analysis, rather than so many people being mistaken over such a long time period.

In my opinion, it is easy to see how the apparent paradox of worker exposure to unknowns can be resolved. The truly acute exposures are rare events, as they are a juxtaposition or product of several event probabilities: waste removal activities in a certain subset of tanks, poor atmospheric dispersion, and dewatering a specific layer in the subset of those tanks containing something like Arsine gas (i.e., a potent acute toxin). A person would need to work very hard to even design and set up a sampling and analysis plan to obtain the analytical data. An exposure assessment, even using SUMMA™ canisters that a worker fills when they "smell something" and/or "feels bad," would be hard pressed to detect such an event.

Interrogation of workers that have complained about occupational health problems, probably only a small subset of those workers that have actually had problems, but for various reasons have not complained, might suggest the probability of

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serious exposure was about once in 3 man\*years during saltwell pumping (one day in 1000 calendar days, based only on one person's experiences). Meaning that a worker would need to carry a badge or SUMMA for three (3) years to be exposed, then have the presence of mind to fill the SUMMA, and report the problem, disregarding any fear of retaliation. (One worker described the environment as being "testosterone charged" or something to that effect, that is, full of bravado at breathing poisons. Example: "What are you, a wuss?" Other means of coercion and control, some very subtle, along with the fear of losing employment or cessation of work and pay, acted to discourage workers from coming forward with complaints.)

Ironically, the situation described above is the antithesis of "control" as defined by the American Congress of Industrial Hygienists (ACGIH); it is better that a level of toxics concentration is high but consistent, rather than the scenario described here; rare events of real high concentrations interspersed with nothing at all. In technical language, the ACGIH says that the standard deviation about the mean concentration should not exceed somewhere around 2 standard deviations to be under "good control," the situation I describe here is many, many standard deviations about a mean. The detection would be below the level that can be detected in the absence of a gas release.

Even when the offending toxins are known, the concentrations could be very different depending on the time and place the sample was taken, and on the state of the nearby tanks or the tank being worked on. My estimates indicate gas and vapor mass emission rates increase substantially above what measured dome-space values indicate during a large-scale gas release event, even for known toxic compounds. For example, only one out of more than 30 tanks had interstitial gas sampled and analyzed for trace gases, where relatively high concentrations of 1,3-Butadiene were detected in the interstitial gas. Simple estimates of dome space concentrations as a function of time during a gas release event show that this compound could exist in the dome space at 3 orders of magnitude higher than ever detected in any tank, unfortunately, I did not have a dome space concentration of 1,3-Butadiene in this specific tank under quiescent conditions to compare with my estimate.

Theoretical studies and laboratory experimentation to understand what toxic gases radiolysis can generate has not been done in this country to my knowledge. The published scientific reports I have obtained indicate radiolysis may generate extremely toxic gases (e.g., hydrogen selenide, arsine, stibine gases, as well as hydrogen sulfide, and well known tank gas such as ammonia). It also appears to me, based on what I have learned from independent experts, that the conditions can exist in the tank waste that would favor the formation of  $H_2Se$ ,  $AsH_3$ , and a host of similar highly toxic gases, given the presence of arsenic, selenium, and/or other compounds, even in the absence of radiation.

Radiation confounds the problem, since, like one expert radiation chemist believes radiation provides, "...sufficient energy deposition in radiolysis that virtually any reaction is possible. In other words, normal chemistry as driven by thermodynamics rarely applies to the radiolytic process...." Precisely under what chemical and environmental conditions the binary hydrides form (e.g., local radiation dose, chemical concentrations, and other local environmental factors the toxic binary hydride gases) is unknown and would likely need to be determined by experimentation in surrogate waste forms under conditions known to exist in the tank waste. Experimentation should have "piggy-backed" onto the flammable gas studies; and only the same level of experimentation can really answer the questions I am posing in this complaint; that is, what kind of toxic gases and vapors could exist in the waste.

The composition of the waste varies from tank to tank, and layer by layer. The tank farms are analogous to a legacy drum disposal site: each barrel uncovered may present a industrial hygiene or safety hazard heretofore not encountered. Sites such as these are normally dealt with under CERCLA using a high level of worker personal protection, and a high level of administrative control at the site boundary for public and worker protection. This is fundamentally unlike RCRA where the facility is designed to manage a specific type or types of wastes, and where the surprises cannot, or have a very low probability of harming human health including workers at the facility. As demonstrated by history, including recent events, tank farms does not place people in the proper PPE, nor do they adequately protect the "public" at the site boundary. This fact can be demonstrated by the historical record, scant as it may be, since the DOE has not done appropriate reporting, nor have they considered these exposure events as an ongoing, interrelated problem.

The premise ORP/ contractor operates under is that, if workers complain about exposures, but their sampling and analysis program does not reveal anything to explain the exposures, ORP/ contractor will and has place more credence in the analytical data rather than the experiences of the workers. Basically, to this day the data CHG has collected cannot fully explain what has happened to these people; not at the concentrations, nor maybe the kinds, of toxins measured so far. What I have done here is work from the other end: that is, assume the worker's reports are true. Either the types

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and/ or concentrations of the chemicals detected are not complete; and/or the combination of the chemicals that have been measured has a worse effect than the chemicals acting separately. Considering synergistic (and antagonistic for that matter) effects of this many chemical is probably impossible.

Finally, the question of cancer must be addressed. As mentioned previously, a number of toxicologists and at least one Occupational Physician believe the waste gases and vapors can cause cancer at below “acceptable” levels. There is no doubt the gases contain at least one “single-hit” carcinogen; that is, a cancer causing agent with no known lower threshold of dose below which cancer will not occur. A single dose of these chemicals increase the exposed worker’s chances of contracting cancer. There are allegations, rumors, and actual examples of cancer from exposure to tank waste, but causation can not be determined because **no one has required the information to demonstrate causality between exposure and subsequent cancer. This is the main problem in the breakdown of this system: RCRA and CERCLA depend upon a robust worker safety program, as required under both OSHA standards, and by 10 CFR 851 (the DOE OSHA) by reference. Time and time again it has been shown the DOE program is not adequate; most recently another of many reports issued demonstrate the IH safety program DOE operates is not adequate.**

**It is a fact that there is no routine monitoring or sampling plan for carcinogens known to be present in the tank headspace or in the waste itself. The above-mentioned Expert Panel has recommended that this occur in the future. Typically, there is no Occupational Exposure Limit set for carcinogens since the fact that cancer may result from exposure generally cannot be calculated on an individual basis. Therefore, the “limit” for occupational exposure to carcinogens is “0” – no threshold. Hanford is unable to establish compliance with that limit.**

**In summary, the level of evidence I have presented here certainly demonstrates a risk or “threat” to workers that is not acceptable under RCRA, OSHA, or DOE’s own standards. I need to add I am not an expert at Industrial Hygiene or chemistry. Most, if not all, of what I am presenting here has been gleaned from others over a period of nearly 20 years. In addition, the essential issue is not hidden; much of what I present here is a matter of public record. A dangerous “group think” mentality pervades Hanford, including the regulatory entities. The undeniable fact that tank farms has periodically reverted to Level A PPE, and that each time this happens additional toxins are found that were not known previously, ought to raise some eyebrows. Like the little boy in the fairy tale who points out the emperor’s nakedness, DOE, its contractors, Ecology, and EPA should be ashamed of their record and cannot be trusted to improve it now.**

### Standards and Codes

The following references apply to this complaint and form a logical argument demonstrating noncompliance with both RCRA, OSHA, and derived DOE health and safety regulations in as much as these regulations overlap to form a coherent system.

#### I. RCRA

##### A. WAC 173-303-400, Interim status facility standards.

##### (3) Standards.

(a) Interim status standards are the standards set forth by the Environmental Protection Agency in **40 CFR Part 265** Section 265.19 of Subpart B, **Subparts F through R**, Subpart W, Subparts AA, BB, CC (including references to 40 CFR Parts 60, 61, and 63), DD, EE, and Appendix VI, which are incorporated by reference into this regulation (including, by reference, any EPA requirements specified in those subparts which are not otherwise explicitly described in this chapter), and

(i) The land disposal restrictions of WAC [173-303-140](#); the facility requirements of WAC [173-303-280](#) through [173-303-440](#) except WAC [173-303-335](#); and the corrective action requirements of WAC [173-303-646](#);

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**Applicability:** This code says that WA state refers to the CFR for interim status facilities. Both SSTs and DSTs are interim status. Therefore, the 40 CFR requirements will apply.

## **B. WAC 173-303-283, Performance Standards**

(1) Purpose. This section provides general performance standards for designing, constructing, operating, and maintaining dangerous waste facilities.

(2) Applicability. This section applies to all dangerous waste facilities permitted under WAC [173-303-800](#) through [173-303-840](#). **These general performance standards must be used to determine whether more stringent facility standards should be applied than those spelled out in WAC [173-303-280](#), [173-303-290](#) through 173-303-400 and 173-303-600 through 173-303-692.**

(3) Performance standards. Unless authorized by state, local, or federal laws, or unless otherwise authorized in this regulation, **the owner/operator must design, construct, operate, or maintain a dangerous waste facility that to the maximum extent practical given the limits of technology prevents:**

- (a) Degradation of ground water quality;
- (b) Degradation of air quality by open burning or other activities;
- (c) Degradation of surface water quality;
- (d) Destruction or impairment of flora and fauna outside the active portion of the facility;
- (e) Excessive noise;
- (f) Conditions that constitute a negative aesthetic impact for the public using rights of ways, or public lands, or for landowners of adjacent properties;
- (g) Unstable hillsides or soils as a result of trenches, impoundments, excavations, etc.;
- (h) The use of processes that do not treat, detoxify, recycle, reclaim, and recover waste material to the extent economically feasible; and
- (i) Endangerment of the health of employees, or the public near the facility.**

**Applicability:** This portion of the WAC code applies to interim status facilities also. Violation of OSHA standards would constitute "endangerment of employees," regardless of whether persons actually even experienced harm. The fact that employees apparently suffer occupational illness, i.e., harm, from the exposure exacerbates the threat. In addition, since the state, through the Labor and Industries Department, accepts that harm has occurred to employees, then it would seem that the performance standards **must** be used and must be actually more stringent than what is normal. What I show here is that the requirement to "control" emissions that "threaten human health," as found in 40CFR265.17 must apply to employees. In addition, my contention is that failure to abide by OSHA standards constitutes a "threat" to employees.

## **C. 40 CFR, Part 265, Subpart J – Tank Systems**

### **265.199 Special requirements for incompatible wastes.**

(a) Incompatible wastes, or incompatible waste and materials, must not be placed in the same tank system, unless **§265.17(b)** is complied with.

(b) Hazardous waste must not be placed in a tank system that has not been decontaminated and that previously held an incompatible waste or material, unless §265.17(b) is complied with.

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**Applicability:** This section means that the requirements of 40CFR265.17 for an incompatible waste mixture are applicable to the tank farms. There is no doubt incompatible wastes have already been mixed in tanks at tank farms. Also further incompatibilities may, and are likely to, still exist.

### **D. 40 CFR, Part 265, Subpart B:**

#### **265.17 General requirements for ignitable, reactive, or incompatible wastes.**

(b) Where specifically required by other sections of this part, the treatment, storage, or disposal of ignitable or reactive waste, and the mixture or commingling of incompatible wastes, or incompatible wastes and materials, must be conducted so that it does not:

- (1) Generate extreme heat or pressure, fire or explosion, or violent reaction;
- (2) Produce **uncontrolled** toxic mists, fumes, dusts, or gases in sufficient quantities to **threaten** human health;
- (3) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;
- (4) Damage the structural integrity of the device or facility containing the waste; or
- (5) Through **other like means threaten human health or the environment.**

**Applicability:** The word “uncontrolled” is not defined in WAC 173-303-040. However, the word “control” referring to emissions that may be a respiratory hazard to workers, employees, has a very specific meaning under the OSHA respiratory protection standard, and thereby 40CFR1910.120, and also under the Clean Air Act.

### **E. “40 CFR PART 267—STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE FACILITIES OPERATING UNDER A STANDARDIZED PERMIT**

#### **267.17 What are the requirements for managing ignitable, reactive, or incompatible wastes?**

(b) If you treat or store ignitable or reactive waste, or mix incompatible waste or incompatible wastes and other materials, you must take precautions to prevent reactions that:

- (1) Generate extreme heat or pressure, fire or explosions, or violent reactions.
- (2) Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment.
- (3) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions.
- (4) Damage the structural integrity of the device or facility.
- (5) Threaten human health or the environment in any similar way.

(c) **You must document compliance with paragraph (a) or (b) of this section. You may base this documentation on references to published scientific or engineering literature, data from trial tests (for example bench scale or pilot scale tests), waste analyses (as specified in §267.13), or the results of the treatment of similar wastes by similar treatment processes and under similar operating conditions.”**

**Applicability** An investigator must determine what documentation is available to satisfy this condition. What documentation is available picks and chooses or otherwise is not based upon, “...published scientific literature.” Bench scale or pilot scale testing, i.e., in this case, laboratory studies in the radiation chemistry of the waste. Waste analysis was not, and probably is not yet complete. I realize *this is a startling allegation that requires an explanation; how could*

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*the Tri-Parties, DOE, EPA, and Ecology fail to perform waste characterization when it is prerequisite to almost everything that follows regarding design, construction, and operation of a RCRA TSD.*

**I should add that I am not a chemist, what I have provided below is the result of years of discussion with chemists not otherwise “under the thumb” of ORP and its contractors, or Ecology for that matter,** and a lot of study on my part. The chemists, engineers, and scientists working under DOE/ORP and its contractors are the ones that provide the answers that their “patrons” want to hear. This is during a time when the contractor is often paid more for spending less

An organization is internally conflicted when it has both regulatory and budgetary/ management responsibilities under the same roof. The “path of least resistance” will result in the latter function subordinating the former; as political forces exert more pressure to do things faster and cheaper, more mistakes occur as the regulatory function becomes progressively weaker. When the so-called external regulatory agencies are “brought into the fold,” so to speak, the situation becomes hopeless. There is no police powers outside the Tri-Parties that can come to the rescue in this situation because the Tri-Parties own the police powers.

I had tried repeatedly to involve independent experts such as chemists and toxicologists to help evaluate the waste chemistry, emissions, and how they impacts workers; Ecology NWP management repeatedly turned down my requests. The following problems address what I believe true, given my limited level of knowledge on this subject (primarily radiation chemistry). I do not contend to be an expert and these statements below are only hypothetical and “food for thought” for future investigations.

1. The exposure data does not include much or sufficient information on how much toxics can be released during a GRE event. The sparse data available from GRE events has not been speciated for the myriad of air toxics. The retained gas data includes analysis from only one tank, and even this amount of information is insufficient to estimate the impact of a GRE event. In addition, the ORP/contractor has not done these estimates. The NWP has continued to ignore the severity of the GRE events.

2. Most neutral chemists, i.e., unaffiliated with tank farms, and experienced with nuclear waste have said to me that tank chemistry is poorly understood, contrary to ORP/contractors statements. The problems of the unusual chemistry are largely exacerbated by the presence of radiation such that normal chemistry cannot readily extrapolate to what is happening in the tanks. Several chemists, including some directly involved with actual experimentation in radiation chemistry, have essentially said that nearly any compound could be produced. I could not find any information on studies focused directly on the generation of toxic gas and vapor from nuclear wastes in this country. However, **in the United Kingdom, and possibly other places outside the United States, recognize that radiolysis can produce compounds such as arsenic hydride (arsine), Hydrogen selenide, and hydrogen sulfide, among other toxic gases.**

3. Based simply on “normal” chemistry, the literature, and information from other chemists, it is highly likely that certain toxic reduced gases would be generated in the tanks. The tank chemistry was and is (with DSTs) designed to maximize the survival of carbon steel against corrosion. The combination of high pH (hydrogen ion concentration), the absence of oxygen, and highly reducing conditions are the same anoxic environments favoring the formation of hydrogen sulfide (H<sub>2</sub>S) and related compounds such as hydrogen selenide (H<sub>2</sub>Se) and hydrogen telluride. In fact, it is probably the case that the Eh (electrochemical potential)/ pH environment of the tanks actually one of the ways hydrogen gas is generated in the tanks, at least according to the experts.

4. The formation of gases such as nitrogen gas, gaseous oxides of nitrogen, methane, ammonia, and hydrogen demonstrates the environment in the tanks is anoxic and reducing, or that it behaves as it is. These gases are highly indicative of a reducing environment. I believe the fact that these gases predominate reflects the relatively high concentration of nitrates in the waste compared to components like sulfur and selenium. Most, but not all of the ammonia, for example, is likely formed from organic compounds containing ammonia or amine group; but at least some ammonia, along with oxides of nitrogen, is are formed from the progressive reduction of nitrates. Therefore, just like anoxic environments in the natural world, it is likely that hydrogen sulfide would also form. Only the relative scarcity of sulfur and sulfur-like compounds makes these gases scarce.

## WHISTLEBLOWER REPORTING FORM

5. The absence of these gases in the dome space reflects the slow rates of diffusion through the nonconvective tank layers and the presence of these compounds as gases rather than solubilized in the liquid. Therefore, because measurements are not made continuously, nor during specific GRE scenarios (such as liquid draw-down during saltwell pumping), then these gases would not show up during "screening" –type sampling of the domespaces alone.

6. **According to various sources, including the NIOSH pocket guide, the reaction between arsenic and "nascent" or newly formed hydrogen is well known to produce arsine gas. It is also well known that radiolysis of tank waste will generate nascent (newly formed) hydrogen. Therefore, in absence of any other considerations it appears very reasonable that arsine gas,** in some quantity, is present in this waste; and even a small amount of arsine could have severe consequences. Arsine gas is toxic at very low concentrations and is one of several toxic gases that could easily explain worker's symptoms.

7. The odor of hydrogen sulfide and other sulfur and sulfur-like compounds is very characteristic and is reliably detected by human sense of smell. The fact is that the human nose is probably as accurate and sensitive as any device in detecting gas such as H<sub>2</sub>S in very low concentrations. Based on the human sense of smell, H<sub>2</sub>S is a very common odor around tank farms. In addition, H<sub>2</sub>S "smell" has caused the evacuation of 200 East on at least one occasion; another more recent event has also been documented at the Waste Treatment Plant, although the plant itself is not the source. No one knows the source of these emissions; but the tanks, or tank waste processing is a likely source since these odors are often centered on the farms. Wells are another possible source, but persons I have asked who were present during well drilling in and around 200 East (particularly the east side of 200E, do not recall H<sub>2</sub>S as being a common smell during well drilling. Septic tanks and leach fields are also clearly not a likely source either.

8. There is a good chance that H<sub>2</sub>S would also be associated with other reduced sulfur and sufficiently sulfur-like compounds, and also compounds of selenium, which is very similar chemically to sulfur. The symptoms and signs of human selenium hydride exposure match very well the experience of exposed workers; including the consideration that the offending toxin would need to be a very potent toxin. Chemical affinity between sulfur and selenium indicate that these compounds could be release at exactly the same time. It is also known from tank sampling that selenium is present in tank layers.

9. H<sub>2</sub>S has never been detected by instruments, even though the Industrial Hygiene plan for tank farms recognizes its presence as a tank farms gas. This is likely another indication that certain compound form as gases and remain trapped in the tank solids until some disturbance triggers their release. Dome space sampling would then not be an adequate way of detecting the presence of such gases. The fact that this gas has not been detected by the sampling and analytical methods used by DOE/ ORP suggest errors in the methods rather than the absence of this gas.

**F. Response to the chemical reaction sub-TAP (Technical Advisory Panel) when they asked tank farms how workers would be protected from toxic gases and vapors:**

WHC-SD-WM-TI-756, Rev. 0

**Chemical and Chemically-Related Considerations  
Associated with Sluicing Tank C-106 Waste to  
Tank AY-102**

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All Hanford Site tanks contain appreciable amounts of ammonia and can contain a myriad of other trace constituents with varying toxicological concerns, as evidenced by gas sampling in the dome space. Air Permit requirements with Washington State Department Ecology assure that the retrieval of C-106 to AY-102 will be protective of both the environment and the health and safety of on and off site workers. As long as gas monitoring related controls are in place and are being implemented (WHC 1996), no special concerns about toxic gas exist.

**Applicability:** According to my management, Ecology has no authority over worker safety. I believe the AG's assigned to Ecology say the same thing. The air permitting requirements under WAC 173-400, General Requirements for maximum emissions state, or stated, "**No person shall allow or permit emissions detrimental to the health, safety, and welfare of another person.**" I believe the AG and NWP management believe they could use this provision to force a greater level of worker safety, but will not use it unless they are forced to. I really have no idea why they will not enforce this provision. EPA also has authority under the General Duty Clause of the "Prevention of Accidental Releases" Clean Air Act regulations.

### II. Standards and Codes: OSHA and 10 CFR 851

Most of this report was actually started before the promulgation of 10 CFR 851, which is DOE's "OSHA." As far as I can tell, given my level of knowledge of 10 CFR 851, all of 29 CFR 1910 applies by reference according to §851.23. Therefore, the references below include only the OSHA references.

#### A. 1910.120 Hazardous waste operations and emergency response.

**1910.120(a)(1)(i)** Clean-up operations required by a governmental body, whether Federal, state local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained);

**1910.120(a)(1)(ii)** Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq);

**1910.120(a)(1)(iii)** Voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites;

**1910.120(a)(1)(iv)** Operations involving hazardous waste that are conducted at treatment, storage, disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations; and"

**1910.120(a)(2)(iii)** Operations within the scope of paragraph (a)(1)(iv) of this section must comply only with the requirements of paragraph (p) of this section. "

**Applicability:** This section of OSHA simply means that these requirements apply to RCRA TSD facilities under interim status. This part (compared to **1910.120(a)(2)(ii)**) simply means that a RCRA facility, because the waste is known (e.g., characterized) **must** operate only under an abbreviated set of conditions for worker protection when compared to a CERCLA site. The respiratory protection section of OSHA still applies, however. The word "**must**" may mean that a RCRA facility cannot routinely operated under the CERCLA provisions, such as high PPE levels, except under emergency conditions.

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**B. 1910.120(a)(2)(i)** All requirements of Part 1910 and Part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste and emergency response operations whether covered by this section or not. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 29 CFR 1910.5(c)(1).

**Applicability:** The part (a)(2)(i) simply brings in the respiratory standard under 1910.134(a), regardless whether it is specifically called- out in this part.

**C. 1910.120(a)(2)(ii)**

Hazardous substance clean-up operations within the scope of paragraphs (a)(1)(i) through (a)(1)(iii) of this section must comply with all paragraphs of this section except paragraphs (p) and (q).

**Applicability:** This section (a)(2)(ii) of OSHA is part of the key to this argument. Namely, by calling the tank farms a RCRA facility, even when it is not adequately characterized and controlled, means that the contractor and DOE/ORP do not need abide by the more rigorous CERCLA standards. For example, important the “buddy system” requirement was used at Tank Farms until the contractor decided not to do it anymore. Failure to abide by this requirement has led to persons supposedly “passing out” at tank farms, rendering them unable to seek assistance.

**D. 1910.120(p)** Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA). Employers conducting operations at treatment, storage and disposal (TSD) facilities specified in paragraph (a)(1)(iv) of this section shall provide and implement the programs specified in this paragraph. See the “Notes and Exceptions” to paragraph (a)(2)(iii) of this section for employers not covered.

**1910.120(p)(1)** Safety and health program. The employer shall develop and implement a written safety and health program for employees involved in hazardous waste operations that shall be available for inspection by employees, their representatives and OSHA personnel. The program shall be designed to identify, evaluate and control safety and health hazards in their facilities for the purpose of employee protection, to provide for emergency response meeting the requirements of paragraph (p)(8) of this section and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and uses of new technologies.

**Applicability:** The tank farms health and safety plan has been, and still is, incomplete. Primarily because it does not, or is not, “...designed to identify, evaluate and control safety and health hazards.” I do not believe that the tank farms has accepted or monitored hazards due to GREs, either large or small-scale ones. I do not believe that the tank farms program has measured all the constituents that likely exist, or could be generated in the waste.

**E. 1910.134**

**Respiratory Protection.**

**1910.134(a)**

**Permissible practice.**

**1910.134(a)(1)** In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section.

**1910.134(a)(2)**

Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall include the requirements outlined in paragraph (c) of this section.

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**Applicability:** This part applies to RCRA TSD per **1910.120(a)(2)(i)**. This section of OSHA is part of the key to this argument. The contractor and DOE/ORP operated under “no controls” as acceptable on their air permit. The controls used to protect workers are negligible, and, at best, are administrative in nature and even these administrative controls are weak. To my knowledge, the following deficiencies exist:

1. The tank farms operate without any engineering controls for non-particulate contaminants, such as gases and most vapors. Even simple atmospheric dispersion is not used, as stacks for the tanks are not very tall, generally about 15 to 20 feet; and in some cases with the single-shell tanks under “passive” ventilation, the vents are essentially at breathing-zone height. Even if dispersion was used it may not work, since the farms are not isolated from other “collocated” facilities. Recently, the DOE/ORP and their contractor have said they would use tall stacks away from the 200 Areas (i.e., so-called “stack in the sticks”) it is doubtful whether they will do this on their own, or whether it will even work, since effects of certain gases may still be too high (e.g., see WTP unusual occurrence).

When asked why the contractor would not use tall stacks, they said they did not use them because they “...would need to get a crane.” Please note that the word “feasible” in the OSHA regulation does not consider cost; feasible means possible.

2. The tank farms does not use effective administrative controls. Tank Farms does not measure when a non-ventilated tank (referred to as “passively” ventilated as opposed to “active” ventilation using a blower), or passively ventilated tank is “exhaling,” or expelling its contents into the ambient air. Simple and cheap instrumentation can be used to directly (flow) or indirectly (pressure) measure passive tank “breathing.”
3. The Standard Hydrogen Monitors (SHMs) were removed from the tanks, despite the fact that hydrogen detectable by this device would be a screening compound for other toxic gases. Tank farms use no other system like this to indicate what is happening in the tank.
4. Tank Farms breathing zone monitoring with hand-held instruments is proven as not effective since workers have been repeatedly exposed to gases, sometimes apparently seriously, despite this type of monitoring happening. In addition, this type of monitoring is not nearly specific or sensitive enough to detect much, except ammonia or organic carbon; many times by the time the instrument detects anything the exposure has already occurred. There is also anecdotal evidence, with some monitoring to support it, of high levels of ammonia, above the IDLH and not distributed uniformly, such that where the instrument is held has significant effects on the readings.

Appropriate respiratory protection zones are not established or enforced. There is a long-standing joke of the “HEPA fence,” and now “carbon fence.” This is a sarcastic comment of the “magic” ability of a simple cyclone fence to remove both particulate contaminants, as would a High Efficiency Particulate Air filter (HEPA), or adsorb toxic gas and vapor as a carbon filter would do. This “joke” exemplifies the absurdity of always establishing the fence line as the exclusion zone boundary and the buffer zone. Ecology employees, including myself, have and could stand within 10 or 20 feet of workers in Level A PPE. Other co-located workers jog or walk or just stand around the fence line of tank farms.

## WHISTLEBLOWER REPORTING FORM

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### When did the event(s) take place?

The event is ongoing. Incidents mentioned in the report occurred at various times over the last 18 years. Accidents causing harm to human health have been happening since the early '90's, and probably earlier.

### Where did the events(s) occur?

Various places on the Hanford site, in the Tri-Cities, and in Seattle.

### Are there other witnesses? If so, please provide their names, telephone numbers, positions, agencies, divisions, contact information, and relation to the improper governmental action.

As I said above, this situation is well documented. I have witnesses for otherwise undocumented events, or sources of information, such as waste chemistry, discussed in the report. These references are in the

Have you reported this information to another agency?    ☒ Yes    ☐ No

If so, which one(s)? Washington Industrial Safety and Health Administration (WISHA), Ecology, Federal Agencies including Department of Energy (DOE) and the Defense Nuclear Facilities Safety Board (DNFSB), even the FBI (by phone, a formal complaint has not been filed) Other than this complaint, I believe all other remedies have been taken.

If you have disclosed the information reported here, what is the current status of the matter?

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**Please mail this form to:**  
Washington State Auditor's Office  
Attn: State Employee Whistleblower Program  
PO Box 40031  
Olympia, WA 98504-0031